National Aeronautics and Space Administration
Goddard Space Flight Center

Inside Wallops

Wallops Flight Facility, Wallops Island, Virginia | Volume XIX-98 | Number 45 | December 14, 1998

Laser Provides First 3-D View Of Mars' North Pole

Measurements by a laser altimeter instrument orbiting aboard NASA's Mars Global Surveyor spacecraft are providing striking new views of the north pole of the red planet and the processes that have shaped it.

This first three-dimensional picture of Mars' north pole enables scientists to estimate the volume of its water ice cap with unprecedented precision and to study its surface variations and the heights of clouds in the region for the first time.

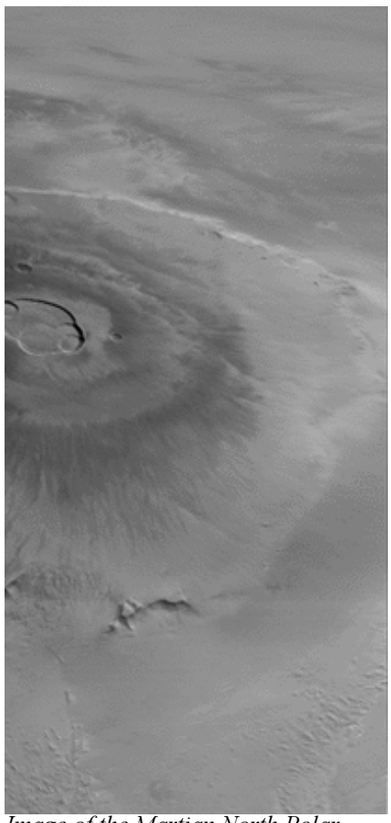


Image of the Martian North Polar Region taken with the Mars Orbiter Camera

The elevation measurements were collected by the Mars Orbiter Laser Altimeter (MOLA) aboard Global Surveyor during the spring and summer of 1998, as the spacecraft orbited Mars in an interim elliptical orbit.

A topographic map reveals that the ice cap is about 750 miles across, with a maximum thickness of 1.8 miles. The cap is cut by canyons and troughs that plunge to as deep as 0.6 miles beneath the surface. "Similar features do not occur on any glacial or polar terrain on Earth," said Dr. Maria Zuber of the Massachusetts Institute of Technology and NASA's Goddard Space Flight Center.

The MOLA data also reveal that large areas of the ice cap are extremely smooth, with elevations that vary by only a few feet over many miles. In some areas the ice cap is surrounded by large mounds of ice, tens of miles across and up to half a mile in height. "These structures appear to be remnants of the cap from a time when it was larger than at present," Zuber said. Impact craters surrounding the cap appear to be filled with ice and dust that was either deposited by wind or condensation, or perhaps remains from an earlier period when the ice cap was larger.

The shape of the Martian polar cap indicates that it is composed primarily of water ice, with a volume of 300,000 cubic miles. The cap has an average thickness of 0.64 miles and covers an area 1.5 times the size of Texas. It's volume is less than half that of the Greenland ice cap and about four percent of the Antarctic ice sheet.

During its mapping of the north polar cap, the MOLA instrument also made the first direct measurement of cloud heights on the red planet. Reflections from the atmosphere were obtained at altitudes from just above the surface to more than nine miles on about 80 percent of the laser profiles.

Wallops Support

Peggy L. Jester, (Computer Sciences Corporation), Wallops Observational Science Branch is a member of the MOLA mission operations team. Her work involved interfacing with the Global Surveyor spacecraft team to build the command sequences that put the instrument in the proper configuration to obtain data. The mission operations team retrieved and monitored the telemetry data to ensure the instrument responded to the command sequences properly and generated the initial data products which was delivered to the science team for analysis.

The principal investigator for MOLA is Dr. David E. Smith of Goddard. The MOLA instrument was designed and built by the Laser Remote Sensing Branch of Laboratory for Terrestrial Physics at Goddard.

Further information about MOLA and images are available on the Internet at: **http://ltpwww.gsfc.nasa.gov/tharsis/mola.html** A color image of the north pole from the camera aboard Mars Global Surveyor is available at: **http://www.msss.com/mars/global_surveyor/camera/images/MENUS/poles_list.html**

TOPEX/Poseidon Finds Global Sea Level Change During El Nino

The 1997-98 El Nino event may have been a major contributor in the average global sea level rising about eight-tenths of an inch before it returned to normal levels, according to scientists studying TOPEX/Poseidon satellite measurements of sea surface height.

"This is the first time we have been able to identify that El Nino may cause a change in average global sea level," said Dr. R. Steven Nerem, a TOPEX/Poseidon science team member at the Center for Space Research at the University of Texas at Austin. "Understanding these short-term variations is important for understanding and detecting long-term variations caused by climate change."

Key to understanding the changes in the ocean are the global maps made by TOPEX/Poseidon. The sea level rise was not confined to the tropical Pacific but also was observed in the Indian Ocean and the southern Pacific. Nerem's team then calculated the average global sea level.

Average global sea level began rising in late March 1997, peaked at 0.8 inches above normal in early November 1997 and then began falling back to normal by the end of July 1998. Sea surface temperature began rising in late October 1996, peaked at 0.7 degrees Fahrenheit in late December 1997 and fell back to 0.2 degrees Fahrenheit at present," according to Nerem.

The TOPEX/Poseidon satellite, uses an altimeter to bounce radar signals off the ocean's surface to get precise measurements of the distance between the satellite and the sea surface. These data are combined with measurements from other instruments that pinpoint the satellite's exact location in space.

Wallops Support

The Wallops Flight Facility Observational Science Branch (OSB) was responsible for specifying and providing the dual-frequency altimeter (ALT), which is the prime instrument for the TOPEX/Poseidon mission. The ALT hardware was developed and built for Wallops by The Johns Hopkins University's Applied Physics Laboratory. The OSB TOPEX group has been continuously involved in altimeter design studies and data analysis from the mid-1970's through the present time.

Weather Summary

by Jim Buchanan

Hopefully your Thanksgiving turkey was not as dry as the weather during November. A dry trend that began in July has continued into the first part of December. Rainfall during November was measured at only 1.32 inches which is 1.5 inches below normal. There were seven days with measurable rain but none of these days had what might be termed significant rainfall. The most rainfall in a 24-hour period during the month, .55 inches, fell in the morning hours on Thanksgiving Day.

For the period, July through November, we are 7.75 inches below the average rainfall totals. The dry trend looks like it will continue for a while, with storm tracks somewhat locked to the north and south of the Eastern Shore area.

Daytime highs for November averaged 59º, which is nearly 1º above normal. Nighttime lows averaged 38º, which is nearly 2º below normal. The monthly average was .9º below normal. If the month seemed rather mild, it was with good reason. There were eight days when the temperature was 65º or higher. The high temperature for the month was 70º recorded on Nov. 20. The average temperature for the last three days of November was almost 68º. There were only four times during the month that the temperature dropped to 32º or less.

As we move past the holiday season, we can look forward to what is usually our coldest month of the year. During January, daytime highs average 44º with nighttime lows at 27º for a daily average temperature of a little above freezing at 36º. Record temperatures for the month are a spring-like 74º set on Jan. 27, 1974. At the other extreme, a record low of -4º was recorded on Jan. 17, 1965. Long-term precipitation averages show a chance for three inches of snow, with an average of two snow days during the month. Rainfall, or rainfall equivalent, averages 3 inches with 10 days of measurable precipitation.

With the holiday season fast approaching, we urge you to be very safety conscious. Thoroughly inspect holiday decorations to be sure they are in proper working condition, don't overload electrical circuits and keep a live Christmas tree watered. If you plan to travel for the holidays, check the weather at your destination. There are some areas of the country that have already experienced significant snowfall.

From your friends in the weather office, we wish everyone a joyous holiday season. Merry Christmas!

Annual Awards Ceremony
December 18
2:30 p.m.
Bldg. D-10

Employees are invited to the Christmas Open House in Bldg. F-3 immediately following the Awards Ceremony.

Sponsored by the Wallops Exchange Morale Association.

Children's Christmas Party
December 21
6 to 9 p.m.
Bldg. F-3

Items for Sale

Love seat and sofa, light blue and beige color, good condition - $180.

Exercise machine, Cardio Glide Plus, like new-$100. Call 757-787-7290 after 5 p.m.

. . . . . .

1992 Pontiac Bonniville, excellent condition.

Love seat and sofa, one year old, excellent condition. Call 757-787-1558 after 5 p.m.

. . . . . .

1994 S-10 Pickup, 84,000 miles, oil change every 3,000 miles. New A/C compressor and hoses. Brake drums and rotors turned. New shoes and pads. New battery. Good Tires. $7,700. Call 757-824-0991 after 5 p.m.

. . . . . .

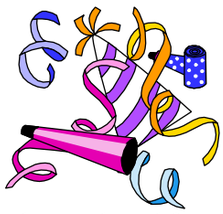
Baldwin piano pro in excellent condition, well-kept. Console piano $1100. See Terry Ewell, or call 757-665-6199, or leave a message on 757-665-4869.

. . . . . .

House For Rent

Two story, three bedroom, one and a half bath home with appliances on Willow Street, Chincoteague. $550 a month. Available immediately. Call Karon Eichelberger, 757-665-6220 after 6 p.m.

New Year's Eve Dance
9 p.m. to 1 a.m.
Margot's Band



Party favors, champagne toast and full breakfast buffet

Tickets are $15 per person and may be purchased from Sandy on x1454, Bldg. F-3 or Pam on x2020, Bldg. E-2.

Mark your calendar for these upcoming MAC events:

Karaoke with New Millennium - Jan. 13

Tittle's Name that Tune - Jan 20.

Wallops Shorts.....

Karon Eichelberger, Cortez; Scott Webb, Information Services Branch; and Betty Flowers, Public Affairs Office attended a Career Fair at Northampton Middle School, Dec. 2.

Inside Wallops is an official publication of Goddard Space Flight Center and is published by the Wallops Office of Public Affairs, Extension 1584, in the interest of Wallops employees.

Editor — Betty Flowers
Photography — Optical Section
Printing — Printing Management Office